

Windows to the Past: Using Gravitational Telescopes to Study our Cosmic Origins

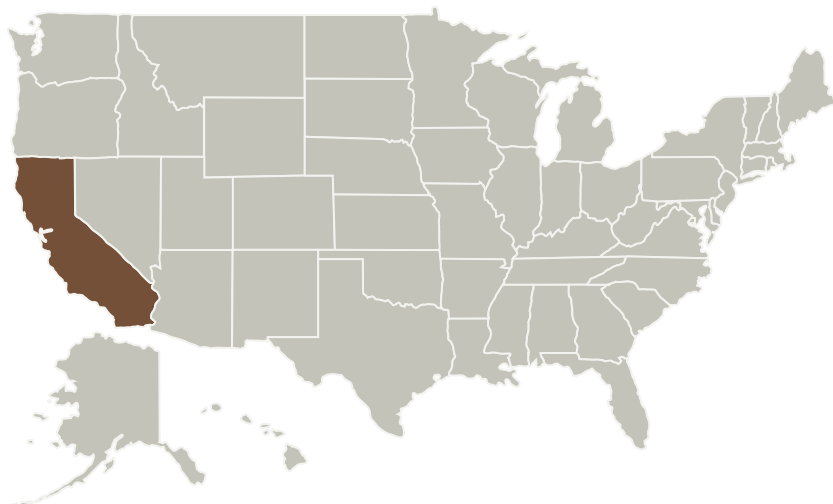
Completed Technology Project (2016 - 2017)



Project Introduction

Among the most important questions in science right now is how the universe evolved from a dense, opaque state into a transparent state rich with galaxies. Despite its vast importance in cosmological history, this transition, known as reionization, is poorly understood. The first stars and galaxies likely reionized the universe, but confirming this has been difficult. A survey of $z > \sim 7$ galaxies is needed. However, such sources are extremely faint due to their high redshift and the increased optical depth during reionization. The magnification gain achieved using galaxy clusters as gravitational telescopes is often needed to study the otherwise unobservable first galaxies. Magnification maps of these telescopes are required to convert observed properties of galaxies into intrinsic ones. I am leading our group's effort to design these maps for a large sample of galaxy clusters in three large programs using NASA's space telescopes: the Hubble Space Telescope (HST) Frontier Fields (HFF), the Spitzer Ultra Faint Survey Program (SURFS UP), and the HST Grism Lens-Amplified Survey from Space (GLASS). I have produced lens models using ancillary data of the 6 HFF clusters. I recently submitted a first author publication for which I developed an improved lens model of the HFF cluster MACSJ0416.1-2403 using GLASS spectroscopic data. I will use the lens models I create for the remaining clusters, coupled with high resolution ground based spectroscopy I will collect in the remaining year and a half of my PhD, to measure the stellar properties of the first galaxies likely responsible for reionization.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Responsible Program:

Astrophysics

Project Management

Program Manager:

Joe Hill-kittle

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Organizations Performing Work	Role	Type	Location
University of California-Davis(UC Davis)	Supporting Organization	Academia	Davis, California

Primary U.S. Work Locations

California

Project Management (cont.)

Principal Investigator:

Marusa Bradac

Co-Investigators:

Austin T Hoag

Kristin L Provost

Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
 - └ TX11.2 Modeling
 - └ TX11.2.1 Software Modeling and Model Checking

Target Destination

Outside the Solar System